

Bog Turtles

Slipping Away

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The bog turtle's (*Clemmys muhlenbergii*) story is filled with irony and contradictions. It is Pennsylvania's smallest turtle. Even though it does not require large areas of habitat to survive, its populations have suffered from more problems associated with habitat loss than any other turtle in the Commonwealth. Bog turtles are cute, petite, and very attractive, which makes them an easy animal for people to like and want to protect. However, those same attributes also make this species very desirable in the black market pet trade. It lives in wetlands primarily in the southeastern counties of Pennsylvania. Unfortunately, those areas also have the highest human population densities in the Commonwealth.

Bog turtles prefer to live in spring seeps and open, marshy meadows, which are usually found in flat or gently rolling landscapes of the valleys of southeastern Pennsylvania. Yet, these same areas are also prime locations in which to build homes and housing developments to support the urban and suburban sprawl that centers around the cities of eastern Pennsylvania. Some well-meaning people want to protect this species so much that they actually unknowingly endanger the turtles by removing them from the wild when they are seen crossing roads.

The bog turtle exemplifies so many different things to so many different people. It remains one of the most endangered and controversial species in the Commonwealth today.

Typically, the turtle is dropped off at a pet store or nature center with little or no information pertaining to where it was picked up. In many cases, these "saved" turtles cannot be released back into the wild because their wetland of origin is unknown. Disease and genetic issues often preclude releasing these individuals in areas other than their native wetland. Bog turtles are listed both as a Pennsylvania endangered species and threatened under the federal Endangered Species Act, and therefore they are protected by special regulations. Consequently, some land developers are concerned that their proposed projects may be affected by its presence.

Meanwhile, others see the bog turtle as a barometer for the quality and health of wetlands and watersheds in their communities. This little turtle, which exemplifies so many different things to so many different people, remains one of the most endangered and controversial species in the Commonwealth today.

Description, life history

Bog turtles are small, semi-aquatic turtles typically reaching a maximum shell length of around four inches at adulthood. Their shells are usually mahogany or black. A bog turtle's most identifiable characteristic is the prominent yellow or orange splotch on each side of the head behind the eye. A lack of yellow or light spots on the carapace (upper shell) helps to distinguish this species from the spotted turtle (*Clemmys guttata*), which may also be found inhabiting wetlands where bog turtles live. Bog turtles are long-lived. They reach reproductive age between five and eight years and may live 20 to 30 years, often spending their entire lives in the wetlands where they were born.

Active during the warmer months, they typically emerge from overwintering during April. Basking, eating, and mating occupies the months of April through June. Egg-laying usually occurs in June and July with the young hatching during late August and early September. Bog turtles construct nests in sphagnum or on tussock sedges where the eggs can be deposited above the water level of the wetland. One to six eggs are deposited and left to incubate unattended for approximately six to eight weeks. The eggs and young are preyed on by mice, raccoons, skunks, foxes, and birds. In Pennsylvania, adult and juvenile bog turtles usually enter the mud to overwinter during late September and October. Thus, for at least



photos-Gianluca Rocco



half of the year, and for that matter half of their lives, bog turtles exist in a dormant state buried in the mud.

Range

Bog turtles are native to the eastern United States ranging from Georgia to the lower New England states. They have a discontinuous distribution with a 250-mile separation between distinct northern and southern populations. Pennsylvania represents the keystone of the northern population, which extends from Maryland and Delaware through Pennsylvania, New Jersey, New York, Connecticut, and Massachusetts. In Pennsylvania, bog turtles occur in counties of the Commonwealth's southeastern corner. Of course, bog turtles are neither randomly nor abundantly distributed throughout their range. They are habitat specialists that require very specific environmental conditions to ensure their survival.

Habitat

The preferred habitat for bog turtles includes open wet meadows, shallow water marshes, spring seeps, flood plain wetlands, bogs, and fens. Bog turtles live in wetlands that offer a mosaic of wet and dry areas, thus providing a variety of micro-climatic conditions that aid in thermoregulation and egg incubation. Deep, soft, mucky soils allow bog turtles to avoid predators and to escape climatic extremes

such as hot and cold temperatures. Groundwater springs, seeps, and subsurface flows provide areas where the turtles can overwinter without the threat of freezing to death. The wetland plants most often found in these areas include cattails, rushes, jewelweed, skunk cabbage, sedges (particularly tussock sedge), sphagnum, and various native grasses. Common trees and shrubs include red maple, alder, willows, and poison sumac.

An open canopy that allows abundant sunlight to reach ground level is an essential component of bog turtle habitat. Bog turtles spend significant periods of their lives basking in the sun. As in all reptiles, proper thermoregulation in bog turtles is vital to the control of metabolic processes. In addition, incubating eggs require appropriate levels of sunlight, warmth, and humidity that are usually lacking in shaded areas.

Prime bog turtle habitat is often described as "early succes-

sional." When open, marshy meadows and fields evolve into a forest, they first become inhabited by large shrubs and small trees. As the trees mature, sunlight is intercepted and filtered, and the composition of plants at the ground level and lower canopy changes. Late successional habitat consists of extensive canopy and mature trees. Because bog turtles rely on early and mid-successional habitats, events that cause those areas to remain open are necessary for their survival. Succession is accelerated by runoff of nutrients and erosion of soils into wetlands. Natural and human-induced succession have led to the elimination of bog turtles from areas where they historically occurred.

Threats to survival

Illegal Activity. Bog turtles have been protected as a Pennsylvania endangered species by the Pennsylvania Fish and Boat Commission since 1974. In November 1997, the U.S. Fish and Wildlife Service added bog turtles to its threatened list. Under state and federal regulations, it is unlawful to sell, trade, barter, possess, import, export, catch, take, or kill bog turtles.

However, in Pennsylvania and throughout the bog turtle's range, poaching has occurred to supply the black market pet trade. Because of their small size, attrac-



tive qualities and overall rarity, these turtles are prized by both domestic and overseas collectors. Because they are slow to mature, have low reproductive rates, and are continually declining because of habitat loss and alteration, the remaining bog turtle populations cannot usually withstand the removal of even a few individuals. Fish and Boat Commission Waterways Conservation Officers and U.S. Fish and Wildlife Service agents are constantly on alert for these threats.

Before becoming federally listed as threatened, bog turtles illegally taken from states where they were protected (which includes all states in their natural range) were easily "laundered" through states outside of their native range. Thus, bog turtles were listed for sale in catalogs from reptile dealers in distant states such as Florida and California where they don't occur naturally. Obviously, these turtles were illegally procured from the wild in states where they were protected. Federal protection under the Endangered Species Act of 1973 eliminates such loopholes.

Invasive plants. Nonnative plants have caused the quality of some bog turtle sites to decline. Two of the most notorious plants are purple loosestrife and common reed. Both nonnative species have colonized many wetland areas in the eastern U.S. These species tend to produce virtual monocultures and out-compete native wetland plants that may have provided food or cover for the bog turtle and other wetland-dependent species. The common reed grows in very thick clumps. These clumps are impenetrable, and they restrict bog turtle movements. They can also grow to heights of eight to 10 feet, thereby shading desirable plant species.

Bog turtles rely on certain native plants for food either in the form of young shoots or the seeds they produce. Also, some plant species such as tussock sedges provide natural nesting sites that are elevated above the water level in the wetland. This allows the eggs to be protected from inundation during water level fluctuations in the wetland. The large, broad leaves of skunk cabbage provide readily accessible areas of shade to provide overhead protection from predators or to assist in the turtle's

thermoregulation. Invasive plants that alter the natural composition and diversity of vegetation in the wetland can quickly reduce a wetland's suitability for bog turtles.

Habitat fragmentation. Habitat fragmentation, for a variety of reasons, leads to the demise of bog turtles. Most bog turtle populations were at one time connected by waterways and wetland complexes. This allowed the individuals in adjoining populations to mingle and maintain the genetic fitness of the species. If local conditions were unsuitable, the turtles could migrate to nearby areas in the watershed. Natural succession, which occurred at a slower rate than human-induced succession, would, over time, cause populations to move in search of new areas. However, road construction, draining and filling of wetlands, pollution, and poor land-use practices have caused historic habitats to shrink, be cutoff from one another, or be eliminated altogether. These modern changes occur at rates faster than the rates at which turtles can respond to the alteration. Also, there usually isn't anywhere else to move to.

Fragmentation of habitat causes the amount of edge to increase in proportion to the interior. Increased amounts of edge are preferred by many animals that prey on bog turtle eggs, young, and adults. The spread of southeastern Pennsylvania's suburbia into bog turtle habitat also tends to elevate the populations of predators. These predators such

as foxes and raccoons adapt well to the broken habitat and areas close to houses, which protect them from pursuit by hunters and trappers. Habitat disturbance in or along wetland margins also promotes plant species that thrive in newly disturbed habitats.

Purple loosestrife and common reed, mentioned earlier, can rapidly colonize disturbed areas, first gaining a foothold, and then spreading into the interior of the wetland. Increased road traffic, whether on new or existing roads, leads to increased possibilities of mortality for turtles that attempt to cross roads. For the most part, bog turtle sites are isolated from one another. Researchers are studying the effects of such isolation in an effort to determine how geographic separation may affect the genetics of those populations.

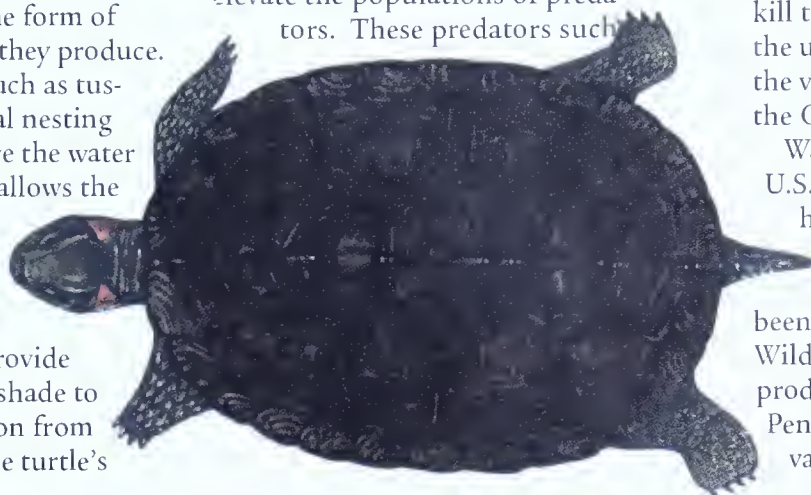
Saving the bog turtle

Work has been underway for some time by state, federal, and local officials to identify and protect bog turtles and their habitats. Cooperation with non-governmental organizations such as The Nature Conservancy, various county and local conservancies, university researchers, herpetological specialists, and many interested Pennsylvania residents has helped to reveal locations where they occur, facilitate population studies, and share vital information.

Light to moderate grazing of cattle has been shown in some cases to retard succession in bog turtle wetlands. In the past, beaver dams, which backed up streams and flooded lowlands, causing the trees to die, created open canopies and suitable areas for bog turtles, particularly after the beavers moved on to another site and the dam collapsed. Today, The Nature Conservancy uses techniques such as controlled burning of unwanted vegetation, girdling of trees to kill them, thus opening the canopy, and the use of selected herbicides to control the vegetation in bog turtle habitats that the Conservancy manages.

Waterways Conservation Officers and U.S. Fish and Wildlife Service agents have devoted considerable time and effort to curb poaching and illegal sales of bog turtles. Funding has been provided through the U.S. Fish and Wildlife Service for field work and to produce informational materials.

Pennsylvania's Wild Resource Conservation Fund has provided funding for



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field surveys, and the production of "Living on the Edge," an educational video about bog turtles in Pennsylvania.

The Fish and Boat Commission, through the Nongame and Endangered Species Unit, reviews hundreds of proposed development projects each year. The project areas are screened for the presence of bog turtles using the Pennsylvania Natural Diversity Inventory (PNDI) database and file information. This database is a cooperative effort among the Department of Conservation and Natural Resources, The Nature Conservancy, and Western Pennsylvania Conservancy along with many researchers. Potential conflicts are resolved through negotiations with project applicants. Where field surveys are required, the Commission in cooperation with the U.S. Fish and Wildlife Service provides technical guidance regarding the proper survey methods to ensure the quality of biological investigations. The Commission maintains a confidential database of known historic and current bog turtle sightings.

The Commission and U.S. Fish and Wildlife Service have conducted joint training sessions with federal, state, and county conservation professionals to educate them in the recognition of bog turtle habitat and the biology of the species. These persons routinely handle various land-use permitting activities at many levels and are valuable assets in the protection of important habitats.

Finally, when the situation warrants, Commission staff have testified in court proceedings to ensure that this species and its habitat are protected. Even though the Commission and U.S. Fish and Wildlife Service have legal responsibility for bog turtles, many other individuals and groups are also interested in its well-being and are active in efforts to protect them.

What can you do?

After considering all of this information, you may be wondering what the average person can do. Involvement in land use and planning decisions at the local level of boro, township, or county can have tremendous effects on the proper use and protection of wetlands and bog turtle habitat. Many communities have embraced their bog turtle



A bog turtle's age can be estimated by counting the annular rings on a plastral (belly) scute.

populations with the realization that protecting the habitat and water quality where bog turtles live leads to direct benefits for the human residents in the watershed. Residents should ensure that development proposals are reviewed with respect to bog turtle issues. Contact a local or regional conservancy or land preservation group to offer support for bog turtle protection efforts. Be vigilant in reporting suspicious activities of persons in southeastern Pennsylvania wetlands who appear to be searching for turtles. Similarly, if bog turtles are seen offered for sale, contact the local or regional law enforcement office of the Commission immediately. If a bog turtle is sighted crossing a road, safely pick it up and carry it off the road in the same direction that it was moving. Moving them back to the side of the road they just came from will only cause them to attempt to cross the road again.

Do not possess or remove bog turtles from the wild. Should you observe one, contact the Fish & Boat Commission Nongame and Endangered Species Unit and report the finding. If it is confirmed, the sighting will increase our knowledge of the turtle's distribution. In recent years, the Commission has documented many new locations through phone calls or letters from alert Pennsylvanians.

The bog turtle is at a threshold in its history. As pressures from develop-

ment increasingly threaten its habitat, much work will need to be done to keep this species present in Pennsylvania. Public involvement, in the form of participation, cooperation and funding, must support any future protection and enhancement activities pertaining to this small, attractive turtle. However, bog turtles, like many habitat specialists, are often barometers of the quality of wildlife habitats in an ever-changing, increasingly altered environment. Meeting the challenges of protecting, conserving, and enhancing bog turtle populations has not been and probably will not be easy. If we're not careful, this animal could slip away from Pennsylvania's natural heritage as easily as it slips into the soft mud of the wetlands it calls home.

Agency Contacts, Additional Resources

PA Fish and Boat Commission, Nongame and Endangered Species Unit, 450 Robinson Lane, Bellefonte, PA 16823-9620.

PA Fish & Boat Commission, P.O. Box 67000, Harrisburg, PA 17106-7000. Contact the Commission for a list of publications including the Commission's "Turtles of Pennsylvania" wall chart and the books *Pennsylvania Amphibians & Reptiles* and *Endangered and Threatened Species of Pennsylvania*.

US Fish and Wildlife Service, PA Field Office, 315 South Allen St., Suite 322, State College, PA 16801.

PA Department of Environmental Protection, Bureau of Dams, Waterways and Wetlands, 6th Floor, Rachel Carson State Office Building, P.O. Box 8554, Harrisburg, PA 17105-8554.

Wild Resource Conservation Fund, P.O. Box 8764, Harrisburg, PA 17105-8764. Available from the Wild Resource Conservation Fund: "Turtles of Pennsylvania" poster (different from the PA Fish & Boat Commission's poster), "Living on the Edge: Bog Turtles" video, bog turtle patch.